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SELECTION CUTTING REDUCES PONDEROSA PINE LOSSES AT PRINGLE FALLS

By

Edwin L. Mowat
Pacific Northwest Forest & Range Experiment Station
Deschutes Branch

One of the aims of selection cutting in ponderosa pine forests is to reduce the heavy mortality, from bark beetle attack and other causes, that is common in most virgin stands. How much the loss can be reduced is shown by a 10-year record at the Pringle Falls Experimental Forest in central Oregon. Here selection cutting has reduced loss on cutting areas to only about one-sixth of the loss on an uncut check area.

Seven large plots, ranging from 60 to 100 acres each, with a total area of 506 acres averaging good site IV, were cut over under a variety of partial-cutting methods in 1937. These cuttings removed about 20, 40, 60, and 80 percent of the original volume which averaged 16,000 board feet per acre. The 80-percent cut followed practically the method previously used on most extensive National Forest timber sales. Two types of marking were applied for each degree of cut except the 80 percent: An economic or "value" marking in which trees of high value and low earning power were removed, and a "thrift" marking in which the trees of poorest vigor and growth and of highest insect susceptibility were cut.

In both types of marking, trees of highest risk, that is, those obviously declining rapidly, were of first priority for cutting even though of low value. The volume of these high-risk trees averaged about 10 percent of the total original stand. These were cut to salvage what would be lost and to reduce the likelihood of epidemic losses.

After this, under the "value" marking the trees of highest net conversion value were of next priority; under the "thrift" marking, those trees that were the least thrifty and most mature.

Since the cuttings were made, mortality from all causes has been checked by annual 100-percent cruises of the cutting areas. During the same period the Bureau of Entomology and Plant Quarantine has made complete annual records of deaths of standing trees from insect attack, etc. on a 320-acre plot in the nearby virgin ponderosa pine natural area. Deaths of standing trees are largely due to bark beetle attack, and all such losses are commonly spoken of as "insect losses," but several other primary causes, such as lightning, root disease, and drought may be involved. Loss records in the virgin stand do not include windfall, but observations indicate mortality from this cause has been very light.

The average volume loss from insects and related causes on the cuttings was only 8.2 board feet, but it was 6 times greater, or 49.7 board feet, in the uncut forest (table 1). As a percent of the stand volume, the insect-caused loss for these selective cuttings was less than one-third of that for the virgin area.

Table 1.--Annual mortality per acre on Pringle Falls
partial-cutting and uncut areas - 1937-47

| Degree of cut (Percent) | Volume - board feet | | Percent of stand volume | |
|---|---------------------|------------------|-------------------------|------------------|
| | Thrift cutting | Value cutting | Thrift cutting | Value cutting |
| <u>Total mortality (including windfall)</u> | | | | |
| 20 | 8.2 | 11.7 | .049 | .094 |
| 40 | 7.7 | 11.9 | .084 | .122 |
| 60 | 15.3 | 12.3 | .180 | .209 |
| 80 | 5.7 | -- | .198 | -- |
| Average - all cuttings | 10.1 | | .112 | |
| <u>Loss from insects, etc. (excluding windfall)</u> | | | | |
| 20 | 7.0 | 9.8 | .042 | .080 |
| 40 | 7.5 | 10.4 | .082 | .106 |
| 60 | 6.3 | 10.3 | .074 | .175 |
| 80 | 5.7 | -- | .198 | -- |
| Average - all cuttings | 8.2 | | .091 | |
| Virgin forest | 49.7 | | .307 | |

A further comparison of the losses caused by insects, etc. may be made on the cutting area itself. Before cutting this had been an insect mortality plot during the years 1931-33, inclusive. For that period the average annual loss per acre was 58.6 board feet, or 0.312 percent of the green stand volume. No significant trend in rate of loss has been apparent on either the virgin or the cut area since the latter was logged.

The thrift marking shows consistently lower losses by insect attack than the value marking. Losses from all causes including windfall are lower with thrift marking except for the 60-percent cut, in which the loss of three large trees by windfall resulted in a higher rate for the plot cut by the thrift rule. The 20-percent cut was apparently as effective as the heavier cuts in reducing total mortality for this first 10-year period. (For bark beetle losses only, the 60- and 80-percent thrift cuttings show lower volume losses than do the 20- and 40-percent.) The percent of stand killed increased with heavier cuts under both marking rules, largely because of the lower reserve volumes on which the percentages are based. How much longer these various degrees of cut will be effective in reducing mortality is still being tested.

Bark beetles were charged directly with 71 percent of the total volume lost on the cut areas. Included with "insect losses" in the table is also 8 percent of the total due primarily to lightning and 2 percent to unknown causes. Wind accounts for the remaining 19 percent of total volume lost.

Pringle Falls is considered to be in an area of relatively light pine beetle hazard, but it seems significant that the reduction in loss rate by partial cuts that remove the trees of poor risk and reserve those of highest thrift is similar to that experienced elsewhere in areas that were suffering more severe beetle damage. For example, light selective cuttings which removed high-risk trees were made during the past 10 years on the Blacks Mountain Experimental Forest in California and on lands of the Weyerhaeuser Timber Company in the Klamath Basin. These light cuts have reduced annual volume loss in this period to 15 to 20 percent of that occurring in virgin stands.

Information on gross and net increment on the Pringle Falls plots is now being compiled and will be made available soon. Preliminary figures indicate that the average total mortality per year since 1937 on the cuttings is only about 12 percent of the annual gross growth.